

1 What is claimed is:

2 1. An optical device comprising:

3 a conductive film having first and second surfaces;

4 at least one aperture provided in said conductive film and extending from said first

5 surface to said second surface; and

6 a surface topography formed on at least one of said first and second surfaces,

7 wherein said surface topography increases an intensity of light incident onto one of said

8 first and second surfaces and transmitted through said aperture;

9 wherein a region on which said surface topography is formed is larger than a region

10 where said light is incident on said conductive film surface, and

11 wherein said aperture is formed on said region on which said surface topography is

12 formed.

13 2. The optical device according to claim 1,

14 wherein said surface topography is formed in the shape of concentric circles.

15 3. The optical device according to claim 1,

16 wherein the diameter of said aperture is smaller than the wavelength of said incident

17 light.

18 4. An optical module comprising:

19 an optical device including a conductive film having first and second surfaces, at

20 least one aperture provided in said conductive film and extending from said first surface to

21 said second surface, and a surface topography formed on at least one of said first and

22 second surfaces, wherein said surface topography increases an intensity of light incident

23 onto one of said first and second surfaces and transmitted through said aperture;

24 wherein the center of light flux of light incident on said conductive film is deviated

25 from the center of said aperture.

- 1 5. The optical module comprising optical device according to claim 4,
2 wherein a displacement between the center of light flux of light incident on said
3 conductive film and the center of said aperture is $1/2$ or less of the diameter of said light
4 flux.
- 5 6. The optical module according to claim 4,
6 wherein the light flux of light incident on said optical device is formed so as to
7 include at least said aperture.
- 8 7. The optical module according to claim 4,
9 wherein a displacement between the center of said aperture and the center of said
10 surface topography is $1/4$ or less of a period of said surface topography.
- 11 8. An optical module comprising:
12 an optical device including a conductive film having first and second surfaces, at
13 least one aperture provided in said conductive film and extending from said first surface to
14 said second surface, and a surface topography formed on at least one of said first and
15 second surfaces, wherein said surface topography increases an intensity of light incident
16 onto one of said a first and second surfaces and transmitted through said aperture; and
17 a means for varying an angle of a polarization surface of light incident on said
18 optical device.
- 19 9. The optical module according to claim 8,
20 wherein said angle is adjusted by varying an angle that brings a direction of said
21 polarization into coincidence with a direction connecting between the center of said light
22 flux and the center of said aperture.
- 23 10. The optical module according to claim 8,
24 wherein the center of light flux of light incident on said conductive film is deviated
25 from the center of said aperture.

1 11. The optical module according to claim 10,
2 wherein a displacement between the center of light flux of light incident on said
3 conductive film and the center of said aperture is $1/2$ or less of the diameter of said light
4 flux.

5 12. The optical module according to claim 10,
6 wherein a displacement between the center of said aperture and the center of said
7 surface topography is $1/4$ or less of a period of said surface topography.

8 13. An optical head for recording and/or reproducing information on an optical
9 recording medium comprising:
10 a slider adjacent and facing to said optical recording medium;
11 an optical device formed on a surface of said slider facing to said optical recording
12 medium, including a conductive film having first and second surfaces, at least one aperture
13 provided in said conductive film and extending from said first surface to said second
14 surface, a surface topography formed on at least one of said first and second surfaces,
15 wherein said surface topography increases an intensity of light incident onto one of said
16 surfaces and transmitted through said aperture;
17 wherein the center of light flux of light incident on said conductive film is deviated
18 from the center of said aperture.

19 14. The optical head according to claim 13,
20 wherein a displacement between the center of light flux of light incident on said
21 conductive film and the center of said aperture is $1/2$ or less of the diameter of said light
22 flux.

23 15. The optical head according to claim 13,
24 wherein the light flux of light incident on said optical device is formed so as to
25 include at least said aperture.

1 16. The optical head according to claim 13,

2 wherein said displacement between the center of said aperture and the center of
3 said surface topography is $1/4$ or less of a period of said surface topography.

4 17. The optical head according to claim 13,

5 further comprising an optical fiber for transmitting light from a light source; and
6 a light-collecting optical system for collecting light emitted from a optical fiber to
7 said optical device.

8 18. The optical head according to claim 17,

9 wherein said light-collecting optical system comprises a lens for collimating light
10 outputted from said optical fiber and a light-collecting lens for directing said collimated
11 light to said optical device.

12 19. An optical head for recording and/or reproducing information on an optical
13 recording medium comprising:

14 a slider adjacent and facing to said optical recording medium;

15 an optical device formed on a surface of said slider facing to said optical recording
16 medium, including a conductive film having first and second surfaces, at least one aperture
17 provided in said conductive film and extending from said first surface to said second
18 surface, a surface topography formed on at least one of said first and second surfaces,
19 wherein said surface topography increases an intensity of light incident onto one of said
20 surfaces and transmitted through said aperture; and

21 a means for varying an angle of a polarization surface of light incident on said
22 optical device.

23 20. The optical head according to claim 19,

24 wherein the center of light flux of light incident on said conductive film is deviated
25 from the center of said aperture.

- 1 21. The optical head according to claim 19,
2 wherein a displacement between the center of light flux of light incident on said
3 conductive film and the center of said aperture is $1/2$ or less of the diameter of said light
4 flux.
- 5 22. The optical head according to claim 19,
6 wherein a displacement between the center of said aperture and the center of said
7 surface topography is $1/4$ or less of a period of said surface topography.
- 8 23. The optical head according to claim 19,
9 wherein said angle is adjusted by varying an angle that brings a direction of said
10 polarization into coincidence with a direction connecting between the center of said light
11 flux and the center of said aperture.
- 12 24. An optical recording/reproducing apparatus for recording/reproducing information
13 on an optical recording medium comprising:
14 an optical head according to claim 13;
15 wherein said optical head reproduces information recorded on said optical recording
16 medium according to light reflected from said optical recording medium.
- 17 25. The optical recording/reproducing apparatus for recording/reproducing information
18 on an optical recording medium comprising:
19 an optical head according to claim 19;
20 wherein said optical head reproduces information recorded on said optical recording
21 medium according to light reflected from said optical recording medium.
- 22 26. The optical recording/reproducing apparatus comprising:
23 an optical recording medium recording information using light from a light source;
24 a recording optical head comprising:
25 a slider adjacent and facing to said optical recording medium;

1 an optical device formed on a surface of said slider facing to said optical
2 recording medium, including a conductive film having first and second surfaces, at least
3 one aperture provided in said conductive film and extending from said first surface to said
4 second surface, a surface
5 topography formed on at least one of said first and second surfaces, wherein said surface
6 topography increases an intensity of light incident onto one of said surfaces and transmitted
7 through said aperture,
8 wherein the center of light flux of light incident on said conductive film is
9 deviated from the center of said aperture; and
10 a reproducing optical head for receiving and reproducing transmitted light passing
11 through said optical recording medium.
12 27. The optical recording/reproducing apparatus comprising:
13 an optical recording medium recording information using light from a light source;
14 a recording optical head comprising:
15 a slider adjacent and facing to said optical recording medium,
16 an optical device formed on a surface of said slider facing to said optical
17 recording medium, including a conductive film having first and second surfaces, at least
18 one aperture provided in said conductive film and extending from said first surface to said
19 second surface, a surface topography formed on at least one of said first and second
20 surfaces, wherein said surface topography increases an intensity of light incident onto one
21 of said surfaces and transmitted through said aperture,
22 a means for varying an angle of a polarization surface of light incident on
23 said optical device; and
24 a reproducing optical head for receiving and reproducing transmitted light passing
25 through said optical recording medium.

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2 28. An optical recording/reproducing apparatus for recording/reproducing information
3 on a magneto-optical recording medium comprising:
4 a recording optical head comprising:
5 a slider adjacent and facing to said optical recording medium,
6 an optical device formed on a surface of said slider facing to said optical
7 recording medium, including a conductive film having first and second surfaces, at least
8 one aperture provided in said conductive film and extending from said first surface to said
9 second surface, a surface topography formed on at least one of said first and second
10 surfaces, wherein said surface topography increases an intensity of light incident onto one
11 of said surfaces and transmitted through said aperture,
12 wherein the center of light flux of light incident on said conductive film is
13 deviated from the center of said aperture; and
14 a reproducing head detecting detects a leaked magnetic flux of said magneto-optical
15 recording medium according to a magneto-resistance effect.
16 29. An optical recording/reproducing apparatus for recording/reproducing information
17 on a magneto-optical recording medium comprising:
18 a recording optical head comprising:
19 a slider adjacent and facing to said optical recording medium,
20 an optical device formed on a surface of said slider facing to said optical
21 recording medium, including a conductive film having first and second surfaces, at least
22 one aperture provided in said conductive film and extending from said first surface to said
23 second surface, a surface topography formed on at least one of said first and second
24 surfaces, wherein said surface topography increases an intensity of light incident onto one
25 of said surfaces and transmitted through said aperture,

- 1 a means for varying an angle of a polarization surface of light incident on
- 2 said optical device; and
- 3 a reproducing head detecting detects a leaked magnetic flux of said magneto-optical
- 4 recording medium according to a magneto-resistance effect.